CLAIMS:

1. A transducing head comprising:

a sensor element having a plurality of terminal pads; and

a shunt electrically connected with the sensor element in parallel for protecting the sensor element from electrical damage during fabrication of the transducing head, wherein the shunt comprises one or more fuses, the shunt configured to be repeatedly tested around during fabrication to allow testing of the sensor element, and wherein the shunt is structured to be permanently electrically removable prior to operation of the transducing head by directing a shunt removal current through the shunt which effectively creates an open circuit in the shunt without causing a damaging current to flow in the sensor element.

2. The apparatus of claim 1 wherein each fuse has a breakdown time, wherein the breakdown time is sufficiently long that a change to an impedance of the fuse during removal of the shunt does not create a damaging current surge through the sensor element.

3. The transducing head of claim 2 wherein the breakdown time of each fuse is greater than about 10 nanoseconds.

4. The transducing head of claim 1 wherein the fuses are formed of multi-layer material.

5. The transducing head of claim 4 wherein the multi-layer material includes a first resistive material having a resistance R_1 and a second resistive material having a resistance R_2, the first and second resistive materials being arranged in parallel, and wherein breakdown of the fuse forms an alloy of the first and second resistive materials, the alloy having a resistance R_A, where $R_1 \| R_2 < R_A$.

6. The transducing head of claim 4 wherein the multi-layer material includes a first resistive material having a resistance R_1 and a second resistive material having a resistance R_2, the first and second resistive materials being arranged in parallel, and wherein breakdown of the fuse causes diffusion of the first and second resistive materials, the fuse having a post-diffusion resistance R_D, where $R_1 \| R_2 < R_D$.

7. The transducing head of claim 1 wherein the fuses are formed of material that sublimes in response to the shunt removal current.

8. The transducing head of claim 7 further comprising a cavity for capturing fuse material as the fuses sublime.

9. The transducing head of claim 7 further comprising a cavity, wherein the fuses are disposed substantially inside the cavity.

10. The transducing head of claim 7 wherein the fuses are formed of Cr.

11. The transducing head of claim 1 wherein each fuse comprises a rectangular thin film resistor having a resistance, a breakdown voltage, a breakdown time, a length, and a width, the length and width configured such that

the breakdown time for the given resistance and breakdown voltage of the fuse is sufficiently long.

12. The transducing head of claim 1 wherein the shunt comprises a plurality of fuses connected in a parallel array, the parallel array having a longer breakdown time than any one of the fuses when the fuses are removed sequentially.

13. The transducing head of claim 1 wherein each fuse has a high temperature coefficient of resistance, such that heat generated by the shunt removal current increases a resistance of the fuse over a sufficiently long period of time prior to breakdown of the fuse.

14. The transducing head of claim 14 wherein the fuse is formed of Ni.

15. The transducing head of claim 1 wherein the shunt includes a fusing resistor and a shunting resistor connected in series, wherein electrical removal of the fusing resistor effectively removes the shunting resistor.

16. The transducing head of claim 1 wherein the transducing head includes a heat sink, the heat sink positioned adjacent the shunt and being electrically insulated from the shunt.

17. The transducing head of claim 1 wherein application of the shunt removal current to the shunt effectively creates an open circuit in one of the fuses and then effectively creates an open circuit in another fuse.

18. The transducing head of claim 1 wherein at least one of the fuses includes a fusing resistor and a shunting resistor, the fusing resistor and the shunting resistor electrically connected in series, and wherein application of the shunt removal current to the shunt effectively creates an open circuit in the shunting resistor by creating an open circuit in the fusing resistor.

19. The transducing head of claim 1 wherein the fuses are connected in a quasi-parallel array, the quasi-parallel array having a longer breakdown time than any one of the fuses when the fuses are removed sequentially.

20. The transducing head of claim 1 wherein the fuses are formed of resistive material having a sufficiently low temperature coefficient of resistance such that a resistive effect of the shunt is substantially constant during fabrication and testing of the transducing head prior to removal of the shunt.

21. The transducing head of claim 1 wherein the shunt is structured to have a high frequency impedance and a low frequency impedance, and wherein the high frequency impedance and the low frequency impedance are not equal.

22. The transducing head of claim 1 wherein the shunt further includes a capacitor electrically connected to the fuses in series.

23. The transducing head of claim 1 wherein the shunt further comprises a capacitor and an inductor electrically connected by a parallel connection, the parallel connection being electrically connected to the fuses in series.

24. The transducing head of claim 1, wherein the shunt is structured to have a high impedance at a testing frequency and a low impedance at frequencies greater than the testing frequency and less than the testing frequency, for allowing testing of the transducing head at the testing frequency and pulses at other frequencies.

25. The transducing head of claim 1 wherein resistances of the fuses are selected such that a damaging current is not created in the sensor element.

26. The transducing head of claim 1 wherein the shunt removal current has a voltage which increases over time as the shunt removal current is applied to the shunt.

27. The transducing head of claim 1 wherein the shunt removal current originates from a preamp electrically connected to the transducing head.

28. A transducing head comprising:

a sensor element having a plurality of terminal pads and a sensor resistance;

a shunt electrically connected with the sensor element in parallel, the shunt including a plurality of removable resistive elements, each resistive element having an element resistance; and

an adjustable transducing head resistance defined by the sensor resistance and the element resistances, wherein sequential removal of some or all of the resistive elements establishes a desired transducing head resistance.

29. A transducing head assembly comprising:

a sensor element;

a first terminal pad and a second terminal pad electrically connected to the sensor element; and

a shunt connected in parallel to the sensor element, the shunt including a first fuse, a second fuse, and a third terminal pad electrically connected between the first and second fuses, wherein the third terminal pad accepts current for temporary bypassing of the shunt and for permanent electrical removal of the shunt by directing a shunt removal current through the shunt which non-simultaneously effectively creates an open circuit in the first and second fuses, while at no point during electrical removal of the shunt is current in the sensor element permitted to reach a damaging level.

30. A transducing head assembly with electrical damage protection comprising:

a sensor element;

a first terminal pad and a second terminal pad electrically connected to the sensor element; and

shunting means connected in parallel to the sensor element for protecting the sensor element from electrical damage during fabrication of the transducing head assembly, the shunting means permitting repeated testing of the sensor element and being permanently electrically removable by a shunt removal current without causing a damaging inductive current through the sensor element.